

WHAT IS CLAIMED IS:

1 1. A device for implanting autologous vascular
2 smooth muscle cells transduced with a gene of interest in a
3 patient, comprising:

4 a tubular elongate member having a wall, which wall
5 has an interior surface, an exterior surface, and pores
6 therein;

7 the autologous smooth muscle cells transduced with
8 the gene of interest immobilized within the pores and upon the
9 interior surface of the wall to form a tubular smooth muscle
10 cell complex having an interior surface; and

11 autologous vascular endothelial cells adherent to
12 the interior surface of the tubular smooth muscle cell
13 complex.

1 2. A device as in claim 1, wherein the tubular
2 elongate member is comprised of a porous synthetic material.

1 3. A device as in claim 2, wherein the porous
2 synthetic material is polytetrafluoroethylene (PTFE), dacron
3 or nylon.

1 4. A device as in claim 3, wherein the tubular
2 elongate member is a vascular graft.

1 5. A device as in claim 1, wherein the autologous
2 vascular smooth muscle cells are transduced with a gene
3 encoding erythropoietin.

1 6. A device as in claim 1, wherein the vascular
2 smooth muscle cells are transduced with a gene encoding
3 granulocyte colony stimulating factor or granulocyte
4 macrophage colony stimulating factor.

1 7. A device as in claim 1, wherein the vascular
2 smooth muscle cells are transduced with a gene encoding Factor
3 IX.

1 8. A device as in claim 1, wherein the transduced
2 cells constitutively express an anticoagulant.

1 9. A device as in claim 1, wherein the transduced
2 autologous vascular smooth muscle cells are immobilized to the
3 tubular elongate member with a polymer.

1 10. A device as in claim 9, wherein the polymer is
2 collagen or fibronectin.

1 11. A method for introducing a gene of interest to
2 a patient comprising:
3 engrafting a device as in claim 1 into the patient's
4 vascular system, wherein the transduced vascular smooth muscle
5 cells contain the gene operably linked to a promoter for
6 expression.

1 12. A method as in claim 11, wherein the gene
2 encodes erythropoietin, granulocyte colony stimulating factor,
3 granulocyte macrophage colony stimulating factor, or Factor
4 IX.

1 13. A method as in claim 11, wherein the device is
2 engrafted into the patient's arterial system.

1 14. A method for treating anemia in a patient,
2 comprising engrafting a device as in claim 1 into the
3 patient's vascular system, wherein the transduced autologous
4 smooth muscle cells express erythropoietin.

1 15. The method of claim 14, wherein the device is
2 engrafted into the patient's arterial system.

1 16. A method for treating an occlusion of a blood
2 vessel in a patient, comprising engrafting a device as in
3 claim 1 into the occluded blood vessel bypassing the
4 occlusion, wherein the transduced cells constitutively express
5 an anticoagulant protein.

1 17. A method as in claim 16, wherein the
2 anticoagulant is a plasminogen activator or antithrombin-III.

1 18. A method as in claim 17, wherein the
2 plasminogen activator is alteplase or urokinase.

1 19. A method for treating or preventing diabetes in
2 a patient, comprising engrafting a device as in claim 1 into
3 the patient, wherein the transduced cells constitutively
4 express an insulin or proinsulin polypeptide.

1 20. A method for treating or preventing a disease
2 in a mammal, comprising:

3 removing vascular endothelial cells and vascular
4 smooth muscle cells from the mammal;

5 transducing the smooth muscle cells with a gene
6 which encodes a product for treating or preventing the
7 disease, operably linked to a promoter;

8 immobilizing on a tubular elongate porous vascular
9 graft device the transduced smooth muscle cells within the
10 pores and interior surface of the graft;

11 coating the interior of the graft device having
12 immobilized thereon the transduced smooth muscle cells with
13 the endothelial cells; and

14 engrafting the device having the immobilized
15 transduced smooth muscle cells and endothelial cells into the
16 vasculature of the mammal to treat or prevent the disease.

1 21. The method of claim 20, further comprising the
2 step of cultivating the vascular smooth muscle cells obtained
3 from the mammal in a medium containing autologous serum prior
4 to immobilizing the cells on the vascular graft.

1 22. The method of claim 21, further comprising the
2 step of cultivating the vascular endothelial cells obtained in
3 a medium containing autologous serum prior to coating the
4 vascular graft.